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Subject: Transportation Noise and Vibration Study Update
Ottawa Public Library / Library & Archives Canada Joint Facility
Aercoustics Project #: 17225.00

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Aercoustics has been retained by Diamond Schmitt Architects (DSAI) and KWC Architects (KWC) to provide acoustical consulting services to support the design of the proposed Ottawa Public Library (OPL) / Library & Archives Canada (LAC) Joint Facility development. The proposed OPL / LAC Joint facility is located at 555 Albert Street in Ottawa, ON.

This memo provides an update to the 2016 Gradient Wind Engineering Inc. (GWE) report GWE16-028 - *Transportation Noise and Vibration Feasibility Assessment 557 & 584 Wellington Street* (GWE report). The GWE report was prepared to support a rezoning application for an eight-building mixed-use development which included, but extended beyond, the proposed OPL / LAC Joint Facility site. Current drawings of the OPL / LAC Joint Facility show that alongside library & archives collections and reading areas, the single five-storey building will house large & small auditoriums, design & fabrication facilities, meeting rooms, and office areas.

It is understood that the City of Ottawa has requested an updated noise impact study for the Library. Aercoustics has prepared this memo to demonstrate that although the GWE report was prepared for a residential development in this location, its analyses and recommendations follow the City of Ottawa requirements and that since the OPL / LAC Joint Facility is a less sensitive land use, the GWE report be considered acceptable to satisfy the requirements for the noise impact study. The predicted road and rail noise levels at the façade of the building suggest that noise levels will be significant but will be sufficiently mitigated by the proposed building envelope design. The predicted ground-borne vibration and ground-borne noise levels are well below both the CN Rail and US FTA guidelines, and as such, no mitigation is required.



This memo relies on the GWE report and examines the future noise and vibration environment in the development area based on the GWE predictions. The applicable limits and noise controls have been updated to account for the fact that the OPL / LAC Joint Facility will be considered a less sensitive land use as opposed to the residential development originally analysed in the GWE report. Noise control features recommended for the development in order to meet noise guidelines are investigated. The memo considers both the Ontario Ministry of the Environment, Conservation and Parks (MECP) guideline NPC-300 “Stationary and Transportation Sources – Approval and Planning” as well as the City of Ottawa Environmental Noise Control Guidelines (ENCG).

We would kindly request that the City of Ottawa accept this memo and the original GWE study as acceptable in lieu of a formal Noise Impact Study.

Guidelines and Criteria

It is assumed that no operable windows will exist through the proposed development. Furthermore, this building is designed for institutional/commercial activities and no residential units will be located on the premises. As such, no points of reception exist as defined by NPC-300, and thus no stationary sources are considered in the analysis.

Noise levels in indoor areas of the building are assessed based on the guidelines set forth by the MECP and ENCG. Table 1 outlines various types of spaces which will exist in the proposed development and their associated best-practices airborne noise level limits. The intended purpose of the development, as a library and office facility, dictates that daytime/evening (07:00 to 23:00) equivalent airborne sound levels (L_{eq}) from road and rail transportation sources must be limited to 45 dBA and 40 dBA, respectively. Other areas of the proposed development which are intended for varying purposes, including offices and retail areas, may require slightly less stringent airborne noise restrictions.

To achieve the required levels, the MECP guidelines and ENCG provide a basis for the type of windows and exterior walls that will be required based on the predicted airborne noise levels.

Table 1: Airborne Sound Level Limits for Road and Rail Noise Impact (07:00 to 23:00)

Type of Space	Required $L_{eq}(16)$ (dBA)	
	Road	Rail
General offices, reception areas, retail stores, etc.	50	45
Theatres, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.	45	40

Although the City of Ottawa ENCG does not specify rail vibration impact criteria, the MECP typically adheres to the vibration study guidelines of CN Rail. The CN guidelines pertaining to vibration propose a limit to vibration levels in terms of 1-second RMS vibration velocity,

which is 0.14 mm/s. This criterion is most appropriate for main line railways but establishes a baseline requirement.

The US Federal Transportation Authority (US FTA) has developed similar but more detailed criteria which are appropriate for ground-borne noise and vibration impacts due to rapid transit corridors, such as the Ottawa LRT. These criteria were applied in the GWE report. Table 2 outlines various types of spaces which will exist in the proposed development and their associated best-practices ground-borne vibration and ground-borne noise level limits.

Table 2: Vibration Level Limits for Ottawa LRT Impact

Type of Space	Ground-Borne Vibration Impact Level (mm/s)	Ground-Borne Noise Impact Level (dBA)
Institutions and offices with vibration-sensitive equipment or activities (schools, churches, libraries, etc.)	0.14	35
Auditoriums and theaters	0.10	35

Prediction Procedure

Road and Rail Noise Methodology

In the GWE report, noise levels associated with road and rail transportation were predicted at 65 receptor positions, nine of which are representative of the currently proposed OPL / LAC Joint Facility layout. These positions are indicated in Figure 1.

Predictions at these nine positions were distributed between two receptor heights: 4th floor plane of window (POW) at a height of 10.5 m and 10th floor POW at a height of 28.5 m. These heights correspond with the 2nd floor POW and 5th floor POW, respectively, in the proposed OPL / LAC Joint Facility layout.

The rail volumes used in the GWE report exceed the current scheduled Ottawa LRT volumes by approximately 40%. This is likely to result in a conservative assessment of rail noise impact but will also reduce the risk of noise impact if future rail volumes increase.

The GWE report was prepared using the roadway classifications and traffic volumes included in the City of Ottawa's Transportation Master Plan and ENCG. There have been no updates or revisions to these documents since the GWE report was prepared in 2016.

Rail Vibration Methodology

In the GWE report, rail vibration levels were predicted at five receptor positions, two of which are representative of the currently proposed OPL / LAC Joint Facility layout. These positions are indicated in Figure 1.

As the Ottawa LRT was not operational at the time of the GWE report, predictions were prepared using the US FTA General Vibration Assessment protocol. This approach utilizes a combination of generalized curves of vibration level for light rail vehicles and adjustments for transit system parameters (vehicle speed, geology, receiving building structure, etc.).

Road and Rail Noise Impact

Table 3 and Table 4 list the daytime L_{eq} due to road and rail traffic as predicted in the GWE report. The included receptors and associated descriptions correspond to façade positions of the current proposed OPL / LAC Joint Facility site layout, as indicated in Figure 1.

Table 3: Predicted Unmitigated Noise Levels Due to Road Traffic

Receptor ID	Description	Source	Leq(16) (dBA)
7	2 nd Floor POW South Façade, Center	Road	67
8	2 nd Floor POW West Façade, SW Corner	Road	66
20	5 th Floor POW North Façade, NE Corner	Road	42
21	5 th Floor POW East Façade, SE Corner	Road	66
22	5 th Floor POW South Façade, SE Corner	Road	69
27	5 th Floor POW South Façade, Center	Road	67
28	5 th Floor POW West Façade, SW Corner	Road	64

Table 4: Predicted Unmitigated Noise Levels Due to Rail Traffic

Receptor ID	Description	Source	Leq(16) (dBA)
5	2 nd Floor POW North Façade, NW Corner	Rail	41
25	5 th Floor POW North Façade, NW Corner	Rail	39

The predicted road and rail noise levels at the façade of the building suggest that noise levels will be significant, particularly along the south, west, and east façades, but will be sufficiently mitigated by the proposed building envelope design. The exterior façade assemblies included in Table 5, and recommended for the OPL / LAC Joint Facility in the Aercoustics report *Aerc002 – Ottawa Library 17225 – Acoustic Design Brief*, are designed with a minimum STC 35.

Table 5: Recommended Acoustic Performance for Exterior Façade Assemblies

Location	Recommended STC Rating
Typical Façade (Curtain Wall & Solid Panel)	35

For typical road and rail traffic noise at the predicted levels, partitions which meet this rating will result in equivalent sound pressure levels of approximately 39 dBA indoors. This meets the requirements of the MECP and ENCG guidelines for indoor spaces located against the façades.

Due to the institutional purpose of the proposed development, it is unnecessary to include any warning clauses as recommended by the MECP and ENCG guidelines.

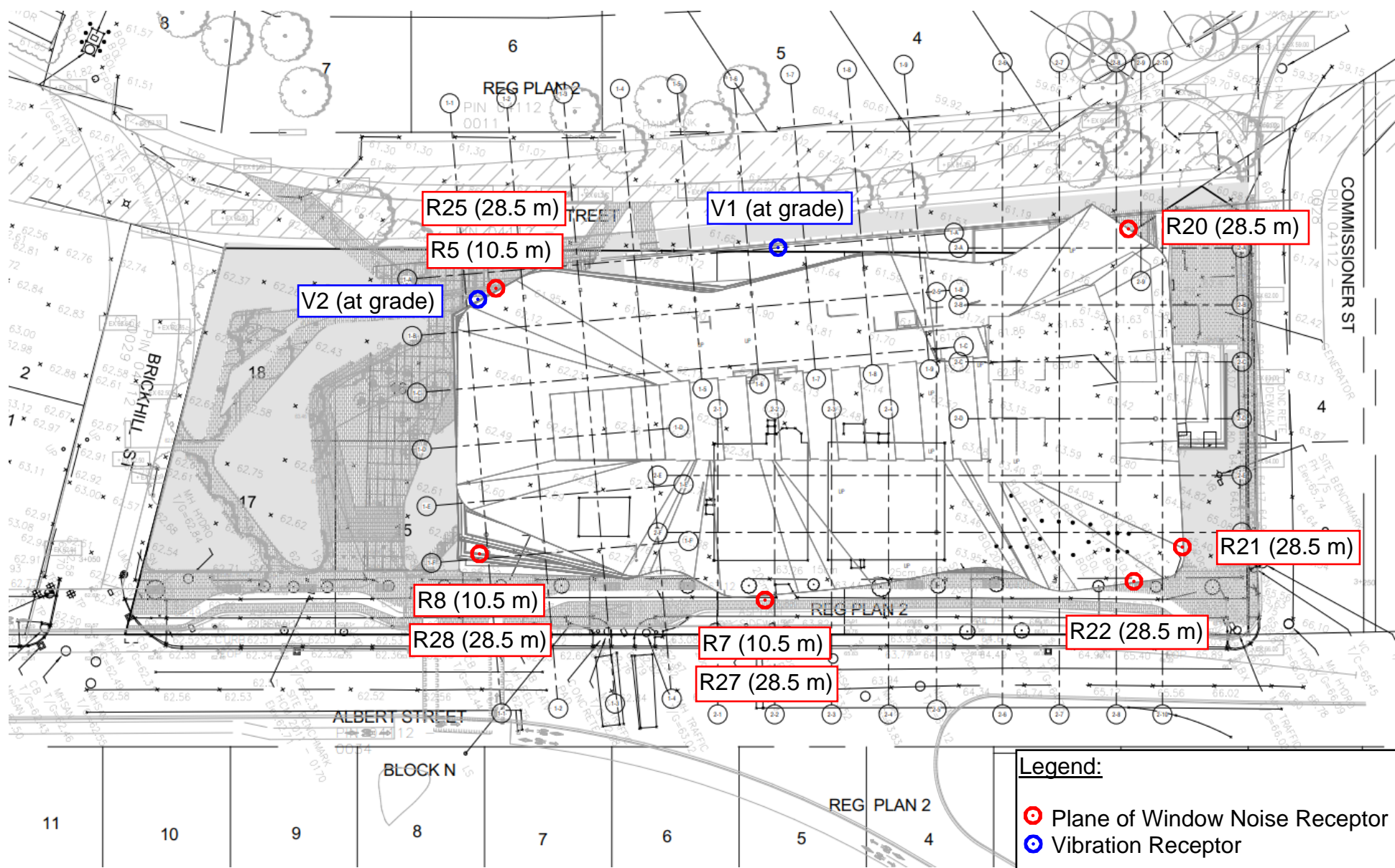
Rail Vibration Impact

Table 6 lists the daytime ground-borne vibration and ground-borne noise levels as predicted in the GWE report. The included receptors and associated descriptions correspond to the current proposed OPL / LAC Joint Facility site layout, as indicated in Figure 1.

Table 6: Predicted Ground-Borne Vibration and Noise Levels Due to Rail Traffic

Receptor ID	Description	1 s RMS Vibration Velocity (mm/s)	Approximate Indoor Sound Level (dBA)
V1	1 st Floor North Façade, Center	0.044	30
V2	1 st Floor North Façade, SW Corner	0.052	31

The predicted ground-borne vibration and ground-borne noise levels are well below both the CN Rail and US FTA guidelines. No further mitigation is required.



The scope of the work outlined in this document is limited to the acoustic, noise and/or vibration control aspects of the design. Contractor to verify all dimensions

Scale: N.T.S.
 Drawn: CB
 Eng: SM
 Date: 2020.04.03

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Project Name:
 Transportation Noise and Vibration Study Update - OPL / LAC Joint Facility
 AEL File: 17225.00

Drawing Title:
 Site Plan with Receptor Locations Used for Transportation Noise and Vibration Assessment

Figure 1